

Posttraumatic Stress Disorder Mediates the Relationship Between Mild Traumatic Brain Injury and Health and Psychosocial Functioning in Veterans of Operations Enduring Freedom and Iraqi Freedom

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Abstract: This study evaluated whether posttraumatic stress disorder (PTSD) mediated the relationship between mild traumatic brain injury (MTBI) and general health ratings, psychosocial functioning, and perceived barriers to receiving mental healthcare 2 years following return from deployment in veterans of Operations Enduring Freedom and Iraqi Freedom (OEF/OIF). A total of 277 OEF/OIF veterans completed the Connecticut OEF/OIF Veterans Needs Assessment Survey; 18.8% of the sample screened positive for MTBI. Compared with respondents who screened negative for MTBI, respondents who screened positive for MTBI were younger, more likely to have PTSD, more likely to report fair/poor overall health and unmet medical and psychological needs, and scored higher on measures of psychosocial difficulties and perceived barriers to mental healthcare. Injuries involving loss of consciousness were associated with greater work-related difficulties and unmet psychological needs. PTSD mediated the relationship between MTBI and all of these outcomes. These results underscore the importance of assessing PTSD in OEF/OIF veterans who screen positive for MTBI.

Key Words: Veterans, combat, soldiers, posttraumatic stress disorder, mild traumatic brain injury, psychosocial, functioning, barriers to care.

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A recent population-based study found that posttraumatic stress disorder (PTSD) and depression mediated the association between mild traumatic brain injury (MTBI) and physical symptoms in a large sample of soldiers returning from Operations Enduring Freedom and Iraqi Freedom (OEF/OIF; Hoge et al., 2008). Specifically, soldiers who screened positive for MTBI were more likely to report poorer health and a high number of somatic (e.g., chest pain) and postconcussive (e.g., memory problems) symptoms compared with soldiers who did not screen positive for MTBI. However, after adjusting for PTSD and depression, MTBI was no longer associated with these symptoms, except for headache. These findings suggest that PTSD and related psychiatric conditions such as depression may

largely explain the relationship between a positive MTBI screen and physical and postconcussive symptoms 3 to 4 months postdeployment.

Postconcussive symptoms associated with MTBI may also affect psychosocial functioning and perceived barriers to healthcare as OEF/OIF veterans readjust to civilian life. In the Hoge et al. (2008) study, a positive MTBI screen was associated with more missed workdays, and PTSD and depression mediated this relationship. Research in civilian populations has similarly found that MTBI is associated with psychosocial difficulties, including underemployment, low income, marital problems, and low community integration and life satisfaction, even at 3 years postinjury (Stalnacke, 2007; Vanderploeg et al., 2007). MTBI may also be associated with unmet and unrecognized needs and barriers to receiving help (Pickelsimer et al., 2007). To our knowledge, no published study has yet examined the relationship between MTBI and psychosocial functioning and perceived barriers to care in OEF/OIF veterans, or whether PTSD may mediate this association.

The purpose of the current study was to evaluate the prevalence and comorbidity of MTBI and PTSD in sample of predominantly National Guard/reserve OEF/OIF veterans, and to extend findings of Hoge et al. (2008) by examining whether PTSD may also mediate the relationship between a positive MTBI screen and general health, psychosocial functioning, and perceived barriers to receiving mental healthcare 2 years following return from deployment. Given that loss of consciousness (LOC) may be associated with increased somatic and psychological symptoms (Hoge et al., 2008; Hill et al., 2009), secondary analyses were also conducted to examine whether veterans who screen positive for MTBI with LOC reported greater perceived barriers to care and psychosocial and health dysfunction compared with veterans who screen positive for MTBI without LOC. We hypothesized that MTBI would be associated with increased perceived barriers to care, and psychosocial and health difficulties in bivariate analyses, but that this association would be mediated by PTSD. Further, we expected that respondents with MTBI with LOC would report greater dysfunction compared to respondents with MTBI without LOC.

METHOD

Sample

Participants in this study ($N = 277$) were drawn from Wave 2 of the Connecticut OEF/OIF Veterans Needs Assessment Survey, which sought to identify salient medical, psychosocial, and economic needs of this population. OEF/OIF veterans were identified alphabetically from a review of copies of discharge papers (DD-214s) by the Connecticut Department of Veterans Affairs until names and addresses of 1000 potential respondents were obtained. To maintain confidentiality of the veterans' names and addresses, surveys were addressed and mailed by the Connecticut Department of Veterans Affairs. No personal identifying information was made available to the authors. The survey was mailed in October 2007 to a sample of 1000 veterans who had served between January 1, 2003 and

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March 1, 2007; as of February 2008, 285 surveys were returned for an overall return rate of 28.5%. Respondents were older than nonrespondents in the sampling frame (33.4 vs. 31.3 years, $t(998) = 2.87$, $p = 0.004$).

Assessments

Demographic and General Health Assessment

A demographic questionnaire assessed age, sex, race/ethnicity, education, and relationship status. This questionnaire also contained questions pertaining to self-reported general health ("How would you rate your overall health in the past month?" rated "Excellent," "Very Good," "Good," "Fair," and "Poor"; answers to this question were combined to "Excellent/Very Good/Good" and "Fair/Poor" for analyses).

MTBI Screen

This screening questionnaire, which was developed for use in Veteran's Administration medical facilities, contains 4 questions used to identify OEF/OIF veterans who may have MTBI (Department of Veterans Affairs, 2007; Government Accountability Office, 2008). It is based on a tool developed by the Defense and Veterans Brain Injury Center (DVBIC, 2006) and has been implemented at selected military bases to screen for TBI among returning OEF/OIF service members (Department of Veterans Affairs, 2007; Government Accountability Office, 2008). Four questions comprise this questionnaire: (1) "During any of your OEF/OIF deployment(s), did you experience any of the following events? (check all that apply): blast/explosion, vehicular accident/crash (including aircraft), fragment/bullet wound above shoulders, fall"; (2) "Did you have any of these symptoms immediately afterward? (check all that apply): loss of consciousness, being dazed, confused, or "seeing stars," not remembering the event," concussion, head injury; (3) "Did any of the following problems begin or get worse afterward?" (check all that apply): memory problems or lapses, balance problems or dizziness, sensitivity to bright light, irritability, headaches, sleep problems; (4) "In the past week, have you had any of the symptoms from section 3?" (check all that apply): memory problems or lapses, balance problems or dizziness, sensitivity to bright light, irritability, headaches, sleep problems. A positive endorsement on each of these 4 questions is required for a positive screen for MTBI. Cronbach α , which measures how well a set of items measures a single unidimensional latent construct (MTBI in this case), was 0.83.

PTSD Checklist-Military Version

The PCL-M is a 17-item screening instrument based on DSM-IV criteria for PTSD (the full instrument is available at: <http://www.pdhealth.mil/guidelines/appendix4.asp>) (PCL-M; Weathers et al., 1991). It was developed by the National Center for PTSD and contains items relevant to stressful military experiences. Scores on this instrument range from 17 to 85. PTSD was identified by a total PCL-M score ≥ 50 and endorsement of each of 3 DSM-IV criteria required for a diagnosis of PTSD (cluster B: intrusive, cluster C: avoidance/numbing, and cluster D: hyperarousal). Cronbach α on PCL-M items was 0.96.

Perceived Barriers to Care Questionnaire

This 6-item self-report instrument assesses obstacles that prevent or dissuade individuals from seeking mental health treatment (sample question: "It is difficult to schedule an appointment") (Hoge et al., 2004; Britt et al., 2008). Responses range from "Strongly Agree" to "Strongly Disagree," with the mean rating on the 6 items serving as the outcome measure. In this sample, Cronbach α on these items that comprise this measure was 0.77.

Psychosocial Difficulties Scale

The Psychosocial Difficulties Scale is a 23-item questionnaire developed by 2 of the authors (M.B.G. and J.C.M.), which assesses psychosocial functioning in areas such as family and peer relationships (e.g., "have difficulty connecting emotionally with family and/or friends"), and work, school, and financial functioning (e.g., "have difficulty finding employment"; "have difficulty paying bills"; "have difficulty seeking employment because do not have discharge papers (DD-214s).") These items are rated on a 4-point scale: "Not a concern," "A slight concern," "A moderate concern," and "A major concern." Higher scores indicate greater psychosocial difficulties. Cronbach α on Psychosocial Difficulties Scale items was 0.89.

Data Analysis

Non-normally distributed continuous variables were transformed using logarithmic base 10 transformations. Demographic, health, barriers to care, and psychosocial variables in the group that screened positive for MTBI (MTBI+) versus the group that did not screen positive for MTBI (MTBI-) were compared using *chi square* tests and logistic regressions for categorical variables (e.g., health ratings), and analyses of variance for continuously distributed dependent variables (e.g., Psychosocial Difficulties Scale). Demographic variables that differed between the groups were entered as covariates in analyses of health, barriers to care, and psychosocial variables. Mediation models following steps outlined by Baron and Kenny (1986) were conducted to examine whether PTSD statistically mediated the relationship between MTBI and health, barriers to care, and psychosocial variables. Separate linear and logistic regression analyses were conducted to examine whether a LOC status among respondents with a positive screen for MTBI was associated with these dependent variables.

RESULTS

In the current sample ($N = 277$), 225 (81.2%) veterans screened negative and 52 (18.8%) screened positive for MTBI. Of the 52 respondents who screened positive for MTBI, 17 (32.7%) reported an injury in which they experienced LOC. Demographic characteristics of these 2 groups are shown in Table 1. The MTBI+ group was significantly younger than the MTBI- group, but did not differ by sex, race/ethnicity, education, relationship status, service duty, branch of military, number of deployments, or time since returning from their last deployment.

Table 2 shows PTSD, health, perceived barriers to care, and psychosocial variables by MTBI screening status. Respondents who screened positive for MTBI were more likely than those who screened negative to meet screening criteria for PTSD, and to report fair/poor health in the past month, and unmet medical and psychological needs. They also scored higher on a measure of perceived barriers to care and a measure of psychosocial difficulties, with significant group differences evident in the family and financial domains (medium effect size; Cohen, 1988).

Mediation Analyses

PTSD mediated the relationship between a positive MTBI screen and health ratings, and barriers to care and psychosocial functioning variables. The odds ratio (OR) of the association between MTBI and self-reported fair/poor health decreased from 3.37 (95% confidence interval [CI] = 1.76–6.45) in bivariate analyses to 2.11 (95% CI = 1.04–4.28) when adjusting for PTSD; the OR for the relation between PTSD and self-reported fair/poor health was 4.37 (95% CI = 2.36–8.07). In bivariate analyses, ORs of the association between MTBI and unmet medical and psychological needs were 3.06 (95% CI = 1.61–5.81) and 2.70 (95% CI = 1.41–5.17), respectively. These ORs decreased to 1.86 (95% CI =

TABLE 1. Demographic and Deployment Characteristics by MTBI Screening Status

	MTBI−	MTBI+	<i>F</i> or <i>Chi Square</i>	<i>p</i>
N	225	52		
Age*	34.1 (0.6)	30.6 (1.1)	6.08	0.014
Sex (% male)	89.2%	94.2%	1.19	0.28
Race/ethnicity			1.51	0.68
White	80.4%	78.8%		
Black	6.7%	5.8%		
Hispanic	5.3%	9.6%		
Other	7.6%	9.8%		
Education			3.45	0.18
High school	20.5%	17.4%		
Some college/college graduate	67.9%	78.8%		
Graduate school	11.6%	3.8%		
Married/living w/partner	53.4%	55.8%	0.10	0.75
Service duty			1.40	0.24
Active duty	28.0%	37.0%		
National guard or reserves	72.0%	63.0%		
Branch of military			6.49	0.09
Army	79.9%	86.5%		
Marines	9.4%	13.5%		
Air force	8.9%	0.0%		
Navy/multiple branches	1.8%	0.0%		
No. deployments			2.13	0.14
One	57.3%	46.2%		
2 or more	42.7%	53.8%		
Time since return from last deployment and survey completion (mo)	22.8 (0.9)	22.9 (2.0)	0.00	0.97

*Groups differ, $p < 0.05$.

MTBI+ indicates positive MTBI screen; MTBI−, negative MTBI screen.

0.92–3.76) and 1.15 (95% CI = 0.52–2.53) and were no longer significant when PTSD was entered into the models; ORs of the association between PTSD and unmet medical and psychological needs were significant at 4.71 (95% CI = 2.60–8.52) and 11.82 (95% CI = 6.13–22.80), respectively. PTSD also mediated the relationship between MTBI and perceived barriers to care (β of MTBI decreased from 0.12 [$t = 2.01$, $p = 0.046$] to -0.04 [$t = 0.63$, $p = 0.52$] after adjusting for PTSD; β of PTSD = 0.48, $t = 8.40$, $p < 0.001$), and psychosocial difficulties (β of MTBI decreased from 0.15 [$t = 2.58$, $p = 0.011$] to 0.07 [$t = 1.13$, $p = 0.26$] after adjusting for PTSD; β of PTSD = 0.26, $t = 4.19$, $p < 0.001$).

Separate analyses of respondents without MTBI or PTSD (MTBI−/PTSD−; $N = 170$), MTBI without PTSD (MTBI+/PTSD−; $N = 18$), PTSD without MTBI (MTBI−/PTSD+; $N = 55$), and MTBI with PTSD (MTBI+/PTSD+; $N = 34$) revealed that the MTBI+/PTSD+ group was younger than the MTBI−/PTSD− group (28.9 vs. 34.7 years, $t(202) = 3.37$, $p < 0.001$), but not the MTBI+/PTSD− (33.8 years) and MTBI−/PTSD+ (32.3 years) groups; no other demographic differences were observed. As shown in Tables 3 and 4, MTBI−/PTSD+ and MTBI+/PTSD+ groups were both more likely than the MTBI−/PTSD− and MTBI+/PTSD− groups to report lower health ratings and unmet medical and psychological needs, and scored higher on the barriers to care and psychosocial difficulties measures; the MTBI−/PTSD− group did not differ from

the MTBI+/PTSD− group, and the MTBI−/PTSD+ group did not differ from the MTBI+/PTSD+ group on these measures.

Loss of Consciousness and Health and Psychosocial Outcomes

Among individuals with a positive screen for MTBI, endorsement of loss of consciousness (LOC) was associated with greater work difficulties (mean [M] = 16.8, standard error of the mean [SEM] = 1.7 vs. 11.8 \pm 0.8; $\beta = 0.38$, $t = 2.87$, $p = 0.006$, $d = 0.79$) and report of unmet psychological needs (75.0% vs. 40.6%, $\chi^2(1) = 5.05$, $p = 0.025$; OR = 4.38; 95% CI = 1.16–16.64). LOC was also marginally associated with greater school difficulties (9.9 \pm 1.2 vs. 7.8 \pm 0.5; $\beta = 0.27$, $t = 1.92$, $p = 0.061$, $d = 0.52$) and increased perceived barriers to mental healthcare (3.00 \pm 0.21 vs. 2.53 \pm 0.16, $\beta = 0.24$, $t = 1.73$, $p = 0.089$, $d = 0.52$), but not with PTSD, self-reported general health, or unmet medical needs (all chi square = <1.98 , all $p = >0.16$). Both LOC and PTSD were independently associated with work difficulties (β of LOC = 0.38, $t = 2.99$, $p = 0.004$; β of PTSD = 0.27, $t = 2.13$, $p = 0.039$) and unmet psychological needs (OR for LOC = 5.63; 95% CI = 1.22–25.90; OR for PTSD = 7.14; 95% CI = 1.58–32.18).

DISCUSSION

This study sought to extend findings of Hoge et al., (2008) by examining whether PTSD may also mediate the relationship between MTBI and general health ratings, psychosocial functioning, and perceived barriers to mental healthcare 2 years following deployment in a sample of predominantly reserve/National Guard OEF/OIF veterans. In the full sample, 18.8% screened positive for MTBI, 6.1% reported injuries involving loss of consciousness (LOC), and 65.4% of veterans with MTBI screened positive for PTSD; these estimates are consistent with a large population-based study of OEF/OIF veterans (Hoge et al., 2008), as well as with a study of veterans evaluated at a polytrauma clinic at a VA Medical Center (Hill et al., 2009). MTBI was associated with greater health and psychosocial difficulties and increased perceived barriers to care, but these associations were all mediated by PTSD.

A growing body of literature suggests the postconcussive symptoms secondary to MTBI may account for long-term health and psychosocial outcomes (see Rees, 2003). Many of the postconcussive symptoms associated with MTBI (e.g., cognitive difficulties) overlap with those in PTSD (Bryant, 2001; Department of Veterans Affairs, 2007), which in turn may be associated with decreased psychosocial functioning and difficulties readjusting to civilian life. Overlapping symptoms between MTBI and PTSD may also explain the nonspecificity of the MTBI screening instrument employed in this study. Indeed, a recent epidemiologic study found that the strongest predictors of PTSD were multiple injury mechanisms and combat-related MTBI, and the strongest predictor of postconcussive symptoms was PTSD, even after overlapping symptoms were removed from the computation of PTSD scores (Schneiderman et al., 2008). Another recent study of over 5800 UK Armed Forces personnel found that a positive MTBI screen was nonspecifically associated with postconcussive symptoms, with PTSD, poor health, and heavy drinking strongly associated with these symptoms (Fear et al., 2009).

In the present sample, another potential explanation for why PTSD mediated the relationship between MTBI and psychosocial functioning is that respondents who experienced MTBI-related symptoms had already recovered from their symptoms prior to completing the survey. Previous research has suggested that patients with MTBI who have cognitive and work difficulties generally recover within a 3-month period of time, but that longer recovery is associated with the presence of comorbid medical, psychiatric, and

TABLE 2. Health, Barriers to Care, and Psychosocial Variables by MTBI Screening Status

	MTBI–	MTBI+	Chi Square or F	p	
PTSD positive screen*	24.4%	65.4%	32.46	<0.001	
Self-reported health in past month*			15.05	<0.001	
Good/excellent	78.7%	52.0%			
Fair/poor	21.3%	48.9%			
Have unmet medical needs*	36.8%	64.7%	13.21	<0.001	
Have unmet psychological needs*	28.1%	52.1%	10.41	0.001	
					Cohen d
Perceived barriers to care score*	2.18 (0.06)	2.54 (0.13)	6.64	0.011	0.38
Psychosocial difficulties scale*	38.42 (0.81)	42.19 (1.69)	4.02	0.046	0.31
Family difficulties*	7.06 (0.18)	8.37 (0.38)	9.56	0.002	0.49
Peer difficulties	6.23 (0.19)	7.03 (0.41)	3.06	0.081	0.28
Work difficulties	12.56 (0.37)	13.51 (0.78)	1.21	0.27	0.17
Financial difficulties*	5.30 (0.13)	6.14 (0.28)	7.60	0.006	0.41
School difficulties	7.82 (0.23)	8.14 (0.49)	0.32	0.57	0.09

Means and standard errors on all continuous outcome variables are adjusted for age.

*Groups differ, $p < 0.05$.

MTBI– indicates negative screen for MTBI; MTBI+, positive screen for MTBI.

TABLE 3. Health Variables by MTBI/PTSD Screening Status

	MTBI–/PTSD–		MTBI+/PTSD–		MTBI–/PTSD+		MTBI+/PTSD+	
	%		%	OR; 95% CI	%	OR; 95% CI	%	OR; 95% CI
Past-month self-reported health								
Good/excellent	85.9%	—	72.2%		56.4%		40.6%	
Fair/poor	14.1%	—	27.8%	2.34; 0.77–7.17	43.6%	4.53; 2.26–9.09*	59.4%	8.99; 3.85–21.01*
Have unmet psychological needs	14.4%	—	25.0%	2.02; 0.60–6.82	70.4%	14.11; 6.74–29.53*	65.6%	11.97; 4.96–28.90*
Have unmet medical needs	28.6%	—	38.9%	1.60; 0.58–4.37	63.5%	4.41; 2.27–8.57*	78.8%	9.56; 3.82–23.96*

Logistic regression analyses are adjusted for age. MTBI–/PTSD– is the reference group.

*OR differs from OR for MTBI–/PTSD– reference group. For all variables, MTBI–/PTSD– and MTBI+/PTSD– groups did not differ; MTBI–/PTSD+ and MTBI+/PTSD+ groups did not differ.

TABLE 4. Barriers to Care and Psychosocial Difficulties Scale Scores by MTBI/PTSD Screening Status

	MTBI–/PTSD–	MTBI+/PTSD–	MTBI–/PTSD+	MTBI+/PTSD+	F	p
Barriers to care total score	2.05 (0.07)	2.24 (0.20)	2.58 (0.12)	2.72 (0.15)	8.19	<0.001
Total psychosocial difficulties score	35.2 (0.8)	35.6 (2.5)	48.4 (1.5)	46.0 (1.9)	25.35	<0.001
Family difficulties	6.5 (0.2)	6.8 (0.6)	9.0 (0.3)	9.3 (0.4)	13.50	<0.001
Peer difficulties	5.5 (0.2)	5.1 (0.6)	8.6 (0.4)	8.2 (0.4)	21.37	<0.001
Work difficulties	11.5 (0.4)	10.9 (1.2)	16.1 (0.7)	15.0 (0.9)	7.96	<0.001
Financial difficulties	5.0 (0.1)	5.8 (0.4)	6.2 (0.3)	6.5 (0.3)	26.45	<0.001
School difficulties	7.1 (0.2)	7.2 (0.8)	10.2 (0.4)	8.7 (0.6)	12.64	<0.001

Means and standard errors on barriers to care and psychosocial difficulties scales are adjusted for age. The MTBI–/PTSD+ and MTBI+/PTSD+ groups scored higher than the MTBI–/PTSD– and MTBI+/PTSD– groups on barriers to care, and total and subscale scores on the psychosocial difficulties measure. For all variables, MTBI–/PTSD– and MTBI+/PTSD– groups did not differ; MTBI–/PTSD+ and MTBI+/PTSD+ groups did not differ.

substance use disorders, including PTSD (Kushner, 1998; Bryant and Harvey, 1999). Studies of OEF/OIF veterans have similarly found that screening positive for a mental health disorder is associated with increased perceived barriers to care (Hoge et al., 2004). Taken together, these results suggest that persistent psychosocial difficulties and perceived barriers to care experienced by OEF/OIF veterans at 2 years postdeployment are likely best explained by PTSD and related postconcussive symptoms that may not necessar-

ily be related to MTBI. Longitudinal studies are needed to examine whether MTBI may increase susceptibility to the development and persistence of PTSD symptoms and psychosocial difficulties in OEF/OIF veterans.

Veterans with a positive MTBI screen with LOC reported greater work difficulties and were more likely to report unmet psychological needs than veterans with a positive MTBI screen without LOC. Both LOC and PTSD were independently associated

with these variables. These results replicate findings of Hoge et al. (2008) that veterans with injuries involving LOC reported greater somatic and postconcussive symptoms, as well as more missed workdays compared with veterans with injuries that did not involve LOC. Unlike previous studies (Hoge et al., 2008; Hill et al., 2009), however, veterans who experienced injuries involving LOC in the current study did not have higher rates of PTSD. This finding may be explained by the small number of respondents with LOC and possible sampling (e.g., older respondents) and recall (e.g., difficulty recalling aspects of injury) bias. Nevertheless, results of this study suggest that LOC is associated with poorer work and psychological outcomes 2 years following deployment in OEF/OIF veterans and underscore the need for more research on the utility of LOC as a marker of exposure severity and its association with postdeployment health and psychosocial outcomes in this population.

Methodological limitations of this study must be noted. First, because the response rate to the survey was relatively low, prevalence and correlates of MTBI may be under- or overestimated. However, some studies suggest that attempts to increase response rates may be counterproductive (Tate et al., 2007). Second, the sample consisted predominantly of white men in the National Guard/Reserves who reside in Connecticut. More research is needed to examine whether these results generalize to more diverse samples in other US states, as well as to nationally representative samples of OEF/OIF veterans. Third, while this study employed a method of classifying MTBI in veterans that is based on a similar instrument developed by Defense and Veterans Brain Injury Center and that is widely used to screen for MTBI in VA medical centers (Department of Veterans Affairs, 2007; Government Accountability Office, 2008), the reliability and validity of this instrument in clinical and survey administration remains to be examined. There are also conflicting guidelines for MTBI screening, with some screening instruments/criteria more conservative than others (Peloso et al., 2004), so it is not clear whether PTSD may also mediate the relationship between MTBI and health ratings, psychosocial functioning, and perceived barriers to care when other classification methods are used. Sampling and/or recall bias may have affected study results (Wessely et al., 2003). For example, veterans with more severe injuries, PTSD, or related symptoms may have been less likely to return the survey. Finally, due to the brevity of Wave 2 of the Connecticut OEF/OIF Veterans Needs Assessment Survey, other psychiatric comorbidities, such as depression and substance use disorders, as well as postconcussive symptoms, which may be related to general health, psychosocial functioning, and barriers to care in veterans with MTBI (e.g., Hoge et al., 2008) were not assessed. More research is needed to understand the extent to which these conditions impact the relationship between MTBI, PTSD, and functioning.

In conclusion, this study extends the results of a previous study demonstrating that PTSD mediates the relationship between MTBI and physical symptoms to suggest that PTSD also mediates the relationship between MTBI and general health, psychosocial difficulties, and perceived barriers to care in OEF/OIF veterans. While other psychiatric and substance use disorders, and postconcussive symptoms may also be related to psychosocial functioning in this population, these results underscore the importance of assessing PTSD in OEF/OIF veterans with suspected MTBI. They also highlight the need to evaluate the validity and reliability of MTBI screening measures in OEF/OIF veterans, as the screening instrument employed in this study lacked specificity in predicting postdeployment general health, psychosocial functioning, and perceived barriers to mental healthcare, a finding consistent with previous research (Hoge et al., 2008; Fear et al., 2009). More

research is also needed to examine whether PTSD and related conditions may also mediate the relationship between MTBI and cognitive functioning, to develop instruments and/or biomarkers to disentangle the complex relationship between MTBI and PTSD, and to examine whether treatment interventions targeted toward ameliorating PTSD symptoms may improve functional recovery in veterans with suspected MTBI.

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